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OPERATING MANUAL
CIRCULATING GAS HEATERS

1 - **DESCRIPTION:**

These heaters have been designed and manufactured in accordance with the requirements of the PED 97/23/EC. They comprise:

- one or more carbon or stainless steel units, with flanged or screwed inlet and outlet tappings.
- one or more heating elements (rod or cylindrical cartridge type immersion heaters), on a screw-in plug or flange, with wire or terminal output in a remote or local connection terminal box.
- a thermal safety device measuring the unit, fluid or heating element temperature.
- if appropriate, one or more devices limiting the surface temperature of the heating elements.
- if appropriate, a flange or screw tapping in the upper part for the installation of aeraulic instrumentation (relief valve, manometer...).
- if appropriate, a flange or screw tapping in the lower part for the installation of a purge valve (condensates...).
- any lagging (generally in mineral wool) with protected, disoxal or stainless steel jacket.

2 - **CHARACTERISTICS:**

For more details on the scope of the supply and any safety devices consult our catalogues, drawings or commercial specifications.

3 - **ASSEMBLY AND CONNECTIONS:**

3.1 - BEFORE INSTALLATION:

Check that:

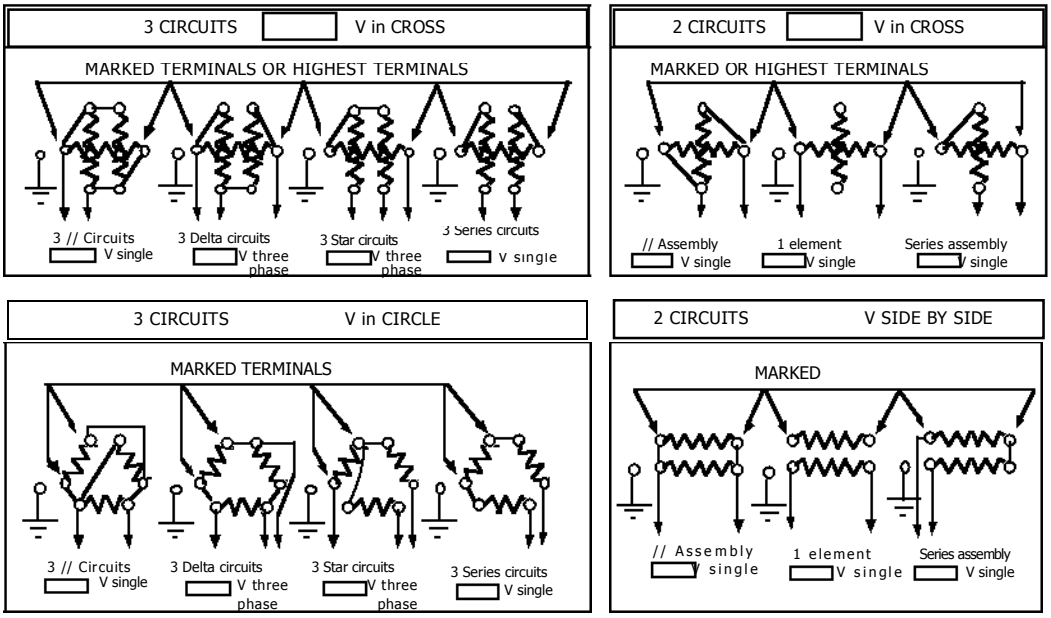
- The unit is correctly positioned as indicated on the drawing (vertically or horizontally as appropriate). When the temperature rise through the heater is large it is preferable to place the fluid inlet on the terminal box side.
- The materials making up the units and the heating elements are compatible with the gas to be heated, depending on the operating conditions (risk of galvanic couples, corrosion, poor mechanical resistance to pressure and temperature).
- The maximum pressure that can arise in the aeraulic circuit is not greater than the pressure PS appearing on the identification plate and in the preliminary information page.
- The pressure loss created by the heater is compatible with the pressure of the flow generator and with the resistance of the aeraulic circuit.
- The fluid circulation direction is correctly complied with.
- The nominal diameter, the installation standard and the inlet and outlet tapping sealing system are correctly matched to the installation pipework.
- A sufficient clearance will permit removal of the immersion heater(s) or monotube(s) from the tank.
- The heater is placed in an external environment compatible with its protection rating and with the quality of the materials making it up. If necessary provide a canopy to protect the heater from bad weather.
- The supply voltage correctly corresponds to the value stated on the identification plate.

3.2 - ASSEMBLY:

- The heater must only be handled using the attachment or lifting arrangements shown on the drawing.
- The body of heaters with diameter less than DN 50 is similar to a piece of pipework; it does not require fixing or support and its lagging is a continuation of the installation lagging. From DN 50, the heater body requires fixing: floor or wall, on foundations, frame or brackets. The fixing feet centreline spacing for certain unlagged heaters of small nominal diameter (DN 50 or DN 80) can be modified if necessary.
- Fixing is done by moving U-bolts or rigid feet with oblong holes. Take thermal expansion phenomena into account, these can reach 2 mm per metre length and per 100°C temperature rise (the maximum temperature TS appears on the identification plate and on the preliminary information).
- When making aeraulic connections precautions must be taken so that the stress inflicted by the pipework on the heater tappings is compatible with the characteristics of the materials used, taking account of their dimensions, the pressure and the temperature. It is sometimes necessary to install deformation compensators, installed according to the rules of the art (bellows, expansion loop, hose....).
- Provide a sufficient clearance to permit the removal of the immersion heaters from the tank (tank removal dimension indicated on the commercial drawing).
- The flow must never be interrupted when the heater is switched on. For this provide a flow controller that irreversibly switches off the heater electrical supply below the contractual minimum mass flow rate indicated on the drawing. ATTENTION: the mass flow rate depends on the volume flow rate, the pressure and the gas temperature.
- For gas thermal control place a temperature measurement sensor on the heater outlet pipework: for preference use a low inertia sensor. Do not install the control sensor directly on the heater body because the measurement will be disturbed by radiation from the heating elements.
- **Provide the safety devices required by legislation** and intended to create freedom from overpressure phenomena in the event of overheating.
- **A safety valve must be installed directly on the sheet metalwork when valves permit the heater to be isolated from its aeraulic circuit.** Whether or not it is installed by VULCANIC, this safety valve does not permit the provision of safety for the whole system, but exclusively mitigates the effects of accidental overheating in the event of closure of the valves. It cannot be set above the maximum rated pressure "PS" for the heater, and its dimensioning must permit the overpressure to be limited to 0.1 x PS.
- **The installer must comply with the legislation relating to preventing risks of burns to personnel.** The 2 main sources of danger cited below are: The body temperature is always greater than the temperature of the gas at the heater outlet. Lag the body and the inlet and outlet pipes if this has not already been done on delivery. On no account lag the heating element electrical connection terminal boxes or the safety devices. Direct the safety valve discharge pipe suitably because when it acts the temperature of the gas that escapes from it can reach the max. value TS indicated on the identification plate and on the preliminary information page.

3.3 - ELECTRICAL CONNECTION:

- POWER: In general, 3 rod type heating elements must be coupled by the installer, according to the diagram below (to avoid any risk of error check the voltage of each rod and compare it with the mains voltage before making the connection):



Immersion heaters with more than 3 rods are generally coupled in the factory and connected to a terminal block.
Consult the wiring diagram located in the terminal box or restated on the drawing. In selecting the connection cable take into account that the temperature in the terminal box can be greater than the external ambient (about 20 to 50°C). In all cases ensure that the connections are correctly tightened.

- EARTH: Ensure that the earth terminal is correctly connected to the installation earth.
- SAFETY AND LIMITING DEVICES:
  The safety devices must irreversibly switch off the electrical supply to the heater in the event of a fault. Wire appropriately taking account of the specific technical features of any devices (sensor or thermostat, breaking power, manual or automatic resetting,...).
  The gas temperature regulation system must be distinct from the safety system. Any heating element surface temperature limiting system must be wired "in cascade" with the gas control.

Furthermore, the user of this equipment must comply with the current country legislation on the use of circulating fluid heaters. The periodic regulatory inspection will permit the effects of fatigue, corrosion and erosion to be quantified.

4 - **COMMISSIONING PROCEDURE:**

4.1 - PRECAUTIONS TO BE TAKEN BEFORE COMMISSIONING:

This heater must never be switched on unless the minimum flow rate can be provided (installation of a mass flow rate controller, or a volume flow rate detector and pressure sensor is strongly recommended).
The safety device is provisionally set at a temperature setting slightly greater than the maximum operating temperature TS max. appearing on the identification plate and the preliminary information page.

4.2 - COMMISSIONING:

- Switch on the heater. Check immediately that the line current complies with that expected and adjust the control units.
- After stabilisation of the nominal operating temperature:
  - manually switch off the safety device and set it to about 10°C above this value, without exceeding the value TS max. appearing on the identification plate and on the preliminary information page.
  - When there is a limit on the surface temperature of the heating elements check that a reduction in flow rate below the contractual minimum causes a reduction or cancellation of the heating power.

4.3 - STOPPING THE INSTALLATION:

On stopping the installation it is necessary to maintain the gas flow for 15 minutes after switching off the heater, in order to permit the removal of the heat accumulated in the heating elements. In certain conditions non-compliance with this instruction can lead to destruction of the heating elements or their environment, including danger for the users.

5 - **SERVICING:**

After 50 hours of operation:
- Verify that all the connections are correctly tightened.

Every six months:
- Same operation as in the previous paragraph.
- If the heater has a purge orifice at the lowest point, flush out with the aim of emptying the stagnant lower parts (condensates...).

Annually as a minimum or more often if necessary:
- If polluting gas is being heated remove the immersion heaters and clean their surface without damaging them, if they are covered with a deposit (fouling risks considerably shortening the life of the heating elements by obstructing the thermal exchange with the gas). Washing and disinfection must be done with products that are regarded as non-corrosive for the materials used.
    - Opening the sheet metalwork is only authorised at ambient temperature, in the absence of pressure and electrical supply. On this occasion the gaskets must be replaced and also defective bolts.
- Remove any condensates that have stagnated in the lower part of the heater.
- After refitting the heating elements repeat the commissioning instructions described in § 4.

Any repair must be subject to an evaluation by an approved body, which will decide on the necessary inspection measures. It will be done under the entire responsibility of the user.

6 - **GUARANTEE:**

The guarantee is compliant with the Electric Construction inter-trade association agreements and our general sales conditions. We guarantee the compliance of the materials and surface treatments, as defined in our documents. On the other hand premature wear of deterioration caused by:

- an electrical supply more than 10% greater than the nominal voltage,
- lack of servicing, shock, clumsiness or inexperience of the user - corrosion of clogging phenomena,
- non-compliance with the present manual, the rules of the art and legislation,

will not engage our responsibility due to the diversity of the parameters that cause them and that are outside our control.